DEPARTMENT OF MINES, MINERALS AND ENERGY
DIVISION OF MINED LAND RECLAMATION

GUIDANCE MEMORANDUM[1] No. 2-01
Issue Date 5/29/01
Subject: Reforestation Reclamation Practices

The Department of Mines, Minerals and Energy (DMME), Division of Mined Land Reclamation (DMLR) through this guidance memorandum is re-affirming that the reforestation husbandry practices outlined in the DMLR Memorandum to Operators No. 3-96 (copy attached) are still recommended. Operators should follow the husbandry practices outlined in Memorandum No. 3-96 when the post mining land use is designated as forestry. Highlights of the Memorandum No. 3-96 are provided below.

Current reclamation practices present three prevalent problems concerning reforestation and timber production: 1) excessively compacted mine soil, 2) inappropriate spoil material, and 3) competition from herbaceous ground covers established to control erosion.

1. Spoil Selection – In addition to available topsoil, at least four feet of good quality mine spoil should be placed at the surface to accommodate the needs of deeply rooted trees. Mine spoils with low to moderate levels of soluble salts, and equilibrium pH of 4.5 to 6.5, and a sandy loam texture are preferred. Oxidized sandstone found near the surface in most areas of the coalfields weathers quickly into good soil medium for trees; however, it must meet required pH limits.

2. Grading – Minimizing soil compaction is extremely important. The problem is more prevalent on level areas that could be very productive if excessive compaction is avoided. Performing the dumping and leveling in separate operations should minimize compaction that occurs during the final lift. Trucks delivering the final layer of overburden can place the spoil in tightly spaced piles across the whole area. After the spoil is in place, a bulldozer can knock the tops off the piles and gently level the area with one or two passes. These practices can be utilized in areas where slope ratios are 2:1 or less. In steeper areas, other methods such as cable dragging may be used, for leveling the final material that is dumped.

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[1] This Memorandum is to be considered a guideline issued under the authority of § 45.1-230.A1 of the Code of Virginia which reads:

"In addition to the adoption of regulations under this chapter, the Director may at his discretion issue or distribute to the public interpretative, advisory or procedural bulletins or guidelines pertaining to permit applications or to matters reasonably related thereto without following any of the procedures set forth in the Administrative Process Act (§ 9-6.14:1 et seq.). The materials shall be clearly designated as to their nature, shall be solely for purposes of public information and education, and shall not have the force of regulations under this chapter or under any other provision of this Code."

3. Tree-compatible groundcover – Reforestation requires a carefully planned balance between ground cover for erosion control and the trees' requirements for light, water and space. Ground covers should include grass and legume species that are slow growing, have a sprawling growth form, and are tolerant of acid (pH 4.5 to 6.5), infertile mine soils. Tree-compatible ground covers are designed to be relatively sparse during the first year and become increasingly lush by the second and third year. This allows tree seedlings to emerge above the ground and ensures their survival. K-31 tall fescue and all clovers (except ladino) should be avoided. For typical seed mixtures for forestry post mining land use, please refer to Memorandum No. 3-96.

4. Tree species selection – Two categories of tree species are recommended: 1) crop trees and 2) nitrogen fixing nurse trees. Crop trees are long-lived species that offer value to landowners as salable forest products. Nurse trees and nurse shrubs species recommended for reclamation planting are nitrogen-fixing plants that benefit crop trees and provide food and cover for wildlife. For examples of crop trees and nurse species, please refer to Memorandum No. 3-96.

While the crop trees listed in Memorandum No. 3-96 are appropriate for mine reclamation, an operator may wish to use some species and avoid other species if the silvicultural activity is also to serve as a carbon sequestration project. An operator that wishes to participate in a carbon sequestration project or other type of project should obtain recommendations for the specific species to use from reliable sources such as Virginia Tech Powell River Project, The Virginia Nature Conservancy, Virginia Department of Forestry or DMME.

The Virginia Department of Mines, Minerals and Energy's Division of Mined Land Reclamation is encouraging operators who propose to implement a post mining land use of forestry to follow the guidelines set out above and those contained in Memorandum No. 3-96. If you have any questions concerning the guidelines, contact Butch Lambert at 276-523-8286.

MEMORANDUM

TO: Coal Operators, Consultants, DMLR Personnel, and Interested Parties

From: ***Danny R. Brown***
Danny R. Brown, Division Director

Subject: Guidelines for Husbandry and Reclamation Practices Appropriate For Forestry Post-mining Land Uses; and Remining Permit Streamline Procedures

Date: July 9, 1996

The Virginia Department of Mines, Minerals, and Energy's Division of Mined Land Reclamation has developed guidance documents concerning: 1) husbandry and reclamation practices relating to the post mining land use of forestry; and 2) streamlined permitting procedures for remining applications.

DMLR is recommending new husbandry and reclamation practices that will promote timber production on reclaimed lands. Questions concerning forestry related issues should be directed to Jerry Legg in the Big Stone Gap office at 540-523-8191.

DMLR is implementing the remining permit streamline procedures to ensure that all remining applications are reviewed expeditiously and in a fair and consistent manner. DMLR will continue to work with our customers to address their respective needs regarding permit reviews, status of applications or other permitting related matters. Recommendations or questions concerning the remining permit streamline procedures should be directed to Norman Enix in the Big Stone Gap Office at 540-523-8286.

RATIONALE

Timber production is an economic objective for some landowners; therefore, reclamation and husbandry practices conducive to productive forestry should be used when forestry is the

intended post-mining land use. DMLR is adding additional husbandry practices to the list of approved husbandry practices listed in Memo to Operators 8-94.

Current reclamation practices present three prevalent problems concerning reforestation and timber production: 1) excessive compacted minesoil, 2) inappropriate spoil material, and 3) competition from herbaceous ground covers established to control erosion.

Independent research indicates that burying salty, alkaline spoils below four feet and reducing compaction and competition from ground covers has the potential to drastically increase timber yield on reclaimed lands. Therefore, the final surface of forest land should be topsoil or brown weathered sandstone and should be less intensively graded, especially on level and gentle slopes where erosion hazard is slight. Less aggressive ground covers should be used to facilitate tree seedling survival.

FORESTRY RECLAMATION PRACTICES

These reclamation practices should be followed when implementing forestry post-mining land uses:

1. Spoil Selection – In addition to available topsoil, at least four feet of a good-quality mine spoil should be placed at the surface to accommodate the needs of deeply rooted trees. Mine spoils with low to moderate levels of soluble salts, an equilibrium pH of 4.5 to 6.5, and a sandy loam texture are preferred. Brown, oxidized sandstone found near the surface in most areas of the coalfields weathers quickly into a good soil medium for trees.

2. Grading – Minimizing soil compaction is extremely important. The problem is most prevalent on level areas that could be very productive. Compaction that occurs during the final lift should be minimized by doing the dumping and leveling in separate operations. Trucks delivering the final layer of overburden can place the spoil in tightly spaced piles across the whole area. After the spoil is in place, a bulldozer can knock the tops off the piles and gently level the area with one or two passes. These practices can be utilized in areas where slope ratios are 2:1 or less.

3. Tree-compatible groundcover – Reforestation requires a carefully planned balance between ground cover for erosion control and trees' requirements for light, water and space. Ground covers should include grasses and legume species that are slow growing, have a sprawling growth form, and are tolerant of acid (pH 4.5 to 6.5), infertile minesoils. Tree compatible ground covers are designed to be relatively sparse during the first year and become increasingly lush by the second and third years. This allows tree seedlings to emerge above the ground and ensures their survival. K-31 tall fescue and all clovers (except ladino) should be avoided. A typical seed mixture for forestry post mining land uses should include:

SPECIES/FERTILIZER	RATE
GRASSES	**lbs/acre**
foxtail millet (spring seeding only)	5
rye (fall seeding only)	30
red top	2
weeping lovegrass	2
perennial ryegrass	5
orchard grass	15

LEGUMES	lbs/acre
kobe lespedeza	5
birdsfoot trefoil	5
Appalow lespedeza	5
ladino clover	3
FERTILIZER	lbs/acre
10-20-202	300

4. Tree species selection – Two categories of tree species are recommended: 1) crop trees and 2) Nitrogen-fixing nurse trees or shrubs. Crop trees are long lived species that offer value to landowners as salable forest products. These include:

Pines:
- pitch x loblolly pine hybrid
- white pine
- Virginia pine

Hardwoods:
- yellow-poplar
- oak species
- white ash
- sycamore
- red maple
- sugar maple
- black cherry

Nurse trees and nurse shrub species recommended for reclamation planting for N-fixing plants that benefit crop trees and provide food and cover for wildlife. Species include:

black locust (should not be used with white pine)
European black alder (should be used with white pine)
bicolor lespedeza
autumn olive
indigo bush
bristly locust

We have attached a list of species available from the Virginia Division of Forestry that may be substituted for some of the above.

HUSBANDRY PRACTICES

The following husbandry practices will be allowed when any forestry application is part of the post mining land use:

1. Split Fertilizer Application – The fertilizers and their rates recommended above should be ideal for both the tree-compatible ground covers and the trees. Compared to fertilizers for hayland/pasture, a lower rate of nitrogen is applied. This reduces the height of the ground cover, but not its density. By the third year, the legumes are supplying a well-regulated, timely supply of nitrogen. However, fertilizer tablets may be added, in addition, to the pine crop trees. The tablets are placed in the "closing" dibble hole when the tree is planted.

2. Ground Cover – Ground cover that is adequate to prevent erosion and promote tree growth, approximately seventy percent, should be used during the first year; however, bond reduction/release cannot be granted with less than 90% ground cover.

3. Species Specific Stem Count for Crop Trees – Pines and hardwoods are usually not compatible; therefore, either pines or hardwoods will be selected. White pines are not recommended for harsh, dry, south-and west-facing slopes. Pitch x loblolly pine hybrids and Virginia pine should do well on most sites. Hardwoods should be planted in mixtures of three or more species, e.g., 100 each of red oak, white oak, yellow poplar, and white ash. All crop trees should be planted on an approximate 10-foot by 10-foot spacing to achieve 400 to 450 planted trees per acre.

4. Nurse Trees/Shrubs – Nurse trees and shrubs will be either planted or hydroseeded with the ground covers. Seedlings are widely available and reasonably priced. They should be interplanted with the crop trees on a 15 by 15 spacing to achieve approximately 200 per acre. Density, spacing and survival are less certain when these species are hydroseeded. Fall hydroseeding is best. Avoid overseeding. Black locust is especially problematic when too much seed is sown; never apply more than 2 ounces per acre. More than 200 stems per acre by age two will have a negative effect on crop trees.

5. Spot Herbicide Application – When ground cover growth is especially vigorous, the use of herbicides to control ground cover growth around trees is recommended. This will reduce competition and allow trees to become established.

If reclamation procedures and husbandry practices are specifically geared for this land use as outlined in the points above, highly-productive forest can be created in a timely manner so that the mine operator, landowner, and community at large will benefit.

TREES AVAILABLE FROM VIRGINIA DEPARTMENT OF FORESTRY

Alder, European Black
Apple, Common
Ash, Green
Birch, River
Cypress, Bald
Dogwood, Graystem
Dogwood, Red Osler
Lespedeza, VA-70
Locust, Black
Maple, Red
Maple, Sugar
Oak, Northern Red
Oak, Sawtooth
Oak, Southern Red
Oak, Water
Oak, White
Persimmon
Pine, Eastern White 2-0 Improved
Pine, Eastern 3-0 Improved
Pine, Loblolly Improved
Pine, Red
Pine, Scotch Bulgarian
Pine, Shortleaf Improved
Pine, Virginia Improved
Spruce, Norway 3-0
Walnut, Black

REFERENCES

Burger, James A., and J. L. Torbert. 1992. Restoring forest on surface-mined land. Virginia Cooperative Extention Pub. 460-123.

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Torbert, John L., and J. A. Burger. 1990. Tree survival and growth on graded and ungraded minesoil. Tree Planter's Notes 41 (2)3-5.

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Torbert, John L., and J. A. Burger. 1994. Influence of grading intensity on ground cover establishment, erosion, and tree establishment on steep slopes. p. 226-231. In Proceedings, International Land Reclamation and Mine Drainage Conference and the Third International Conference on the Abatement of Acidic Drainage. April 24-29, 1994. Pittsburgh PA.

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